SYSTEMS AND METHODS FOR PHASE MEASUREMENTS

ABSTRACT OF THE DISCLOSURE

Preferred embodiments of the present invention are directed to systems for phase measurement which address the problem of phase noise using combinations of a number of strategies including, but not limited to, common-path interferometry, phase referencing, active stabilization and differential measurement. Embodiment are directed to optical devices for imaging small biological objects with light. These embodiments can be applied to the fields of, for example, cellular physiology and neuroscience. These preferred embodiments are based on principles of phase measurements and imaging technologies. The scientific motivation for using phase measurements and imaging technologies is derived from, for example, cellular biology at the sub-micron level which can include, without limitation, imaging origins of dysplasia, cellular communication, neuronal transmission and implementation of the genetic code. The structure and dynamics of sub-cellular constituents cannot be currently studied in their native state using the existing methods and technologies including, for example, x-ray and neutron scattering. In contrast, light based techniques with nanometer resolution enable the cellular machinery to be studied in its native state. Thus, preferred embodiments of the present invention include systems based on principles of interferometry and/or phase measurements and are used to study cellular physiology. These systems include principles of low coherence interferometry (LCI) using optical interferometers to measure phase, or light scattering spectroscopy (LSS) wherein interference within the cellular components themselves is used, or in the alternative the principles of LCI and LSS can be combined to result in systems of the present invention.